

April 19, 1930

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AVIATION

The Oldest American Aeronautical Magazine



REVIEW OF
EVENTS AT
Detroit

VALUATION
April 19, 1930



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Contents for April 19, 1930

VOLUME 26, NUMBER 15

Copyright, 1930, by McGraw-Hill Publishing Company, Inc.

Here and There at the Detroit Show 792

Thanks to the exhibits and activities at the 40th Annual Detroit Show. By R. Henry Brown, Jr.

Planes, Engines and Accessories at the Detroit Show 796

A general survey of the 40th Annual Detroit Show and a comparison with past shows. By Lester E. Nelson.

How Operators Look at Aircraft 810

Discussed by the A.A.C. at Detroit, along with developments in aircraft, detail engines and other matters. By Edward F. Watson.

EDITORIALS 792
GENERAL NEWS 796
AIRPORTS AND AIRLINES 810
PERSONAL ACTIVITIES 811

COMING

(Aviation photography in Alaska. EA description of the Gates-Cheney Airport. Coming developments—The Boeing B-24, the new Keystone-Lancaster. Amphibious: The Savoia Marchetti amphibious.)

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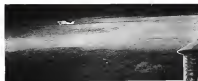
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THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

A BOSTON PUBLICATION

EDWARD P. WARNER, Editor

VOLUME 11, . . . April 19, 1930 . . . NUMBER 11



The World Is NOT Coming to an End

AVIATION sent its first copy from the press fourteen years ago. In fourteen years of sharing the triumphs and tribulations of the aircraft industry, we have never experienced more delusion than at the present time. Business has slowed down. It has slowed down badly, but we refuse to admit that there is any reason for celebrating that fact by prophecies of immediate and complete disaster. Admitting that an excess of optimism was rampant over a considerable period in 1928 and 1929, the appropriate measure of conservatism from that state is a re-establishment on the solid ground of plain facts and sober judgment. We cannot correct for an unreasonable optimism at some period past by leaping ourselves into an equally unreasonable delusion of pessimism.

Let us be frank. We have had a boom, backed by an abnormal public psychology. Other industries have encountered that same thing many times in the past, and there has never been but one outcome—a recession varying in duration between a very pronounced let-down and a major slump. We need not flatter ourselves that our own experiences are unique. Others have survived the slump and gone on to new prosperity, and to such we.

We do not suggest that this theory will prove to believe that all is lost is universal. It is not even general, but it is not as rare as it should be. Discouragement is not only no substitute for effort, it is not even as incentive to it. Among the slogans for which the aircraft industry has no need at the present time, high rank goes to "It can't be done," and "The public is down on us."

Let us be frank. What have we to sell? We have the fastest—comparably the fastest—form of transportation ever known to man. It is unique among means of overland communication in its ability to be completely independent of proposed roadbeds. It is, in the long run,

bound to be appreciably more costly than surface travel, especially when the private ownership and operation of a plane is in question. Private operation is, in the state of the present comparatively limited development of surface transportation, often subjected to more perfectly unnecessary inconveniences. It is appreciably more dangerous under average conditions than other means of travel, but with proper equipment and organization and the most competent personnel the danger can be made small enough so that it should not prove a deterrent. Finally, air transport, like that upon the water, is less reliable than the movement of land vehicles, more subject to interruption by unfavorable weather conditions.

There in twenty years is a summary of our inherent position. There is a broad market for the advantages that the airplane has to offer, even when the present disadvantages must be admitted. As progress is made towards overcoming the drawbacks, and some of them can be very largely overcome by competent management and organization without requiring any new technical development, the market grows.

The airplane business for 1930 is not going to show the percentage of increase over 1929 that came to be the unthinkably unsteady during the three preceding years. That rate of advance could not continue indefinitely in any case. The whole history of industry afforded no precedent for such a thing. Business for 1930 may in the appropriate proportion exceed that for 1929. It may fall somewhat below it. We can speculate, but it is too early to reach any definite conclusion. Even if it does fall below, however, we shall still be far from any disaster. The airplane will still have something to offer that the public needs. Increased speed in transportation has never yet been consigned to the dust-bin. There will be waves of speculation and depression, but this industry as a whole is bound in the long run to stay

on the agenda. This is a good time, and the counsel is addressed especially to those who are allowing themselves to feel discouraged not only about their own prospects but about the whole industry of which they are a part, to look back several years, not ahead at least two or three, and try to regain and to obtain a perspective.

//

Short-Haul Aviation

ONE OF the most significant recent aeronautical developments has been the rapid establishment of air ferry lines. Such services have been established in Seattle, San Francisco, and other American cities. The immediate volume of the general public's response has been a sufficient proof of the real service that is being rendered. For the most part these air ferries actually operated over the same general routes as the established ship ferries, using amphibian planes with waterfront terminals so close to the centers served that it is often possible to cut the time required by the surface transport system in half, even though the air distance is as low as ten miles, as is the case at San Francisco Bay.

Air Ferries, Ltd., of San Francisco, carried 11,878 passengers during the first 30 days of operation. After 30 days a traffic check showed that 35 per cent of the passengers had used the Air Ferries before and were becoming "habitual" passengers. The check further revealed that 71 per cent of the passengers using the service were bound on business errands rather than just being out "for shopping"; that 32 per cent chose the air ferry in preference to other means of transportation because there were in a hurry; and that 5,400 persons were carried during the first month who had never been up in an airplane before. It is hard to estimate the value of these 5,400 inductions to the continued progress of air transportation. It is even harder to estimate the tremendous impression which that aerial shuttle service must create among the thousands of passengers on the waterborne ferry-boats, as they see the air ferries slip swiftly past them day after day.

The most encouraging aspect of the air ferry development is the vast field now ripe for the establishment of such services. While air ferries have been inaugurated in but three or four of our larger municipalities, there is an evident field for them in at least twenty American cities. The rapid expansion possible in each center is well illustrated by the history of San Francisco's aerial ferry, which started with three amphibian planes and now plans to have at least twenty in operation by mid-summer.

The amphibian planes, with its ability to land in water areas close to the centers served, and to dump up runways to a day float for the rapid transfer of passengers has made ferry service possible. Whenever the physical

characteristics of a metropolitan area are such as to make it possible for the airplane, either amphibian, flying boat, or launch, to serve a natural portion of the time spent in local travel by a majority of the population, there is a field ripe for the air ferry.

It is gaining rapid recognition because it renders a definite and valuable service. For itself, it handles a substantial portion of the daily local traffic in the areas served. For the rest of the industry it is taking new thousands of persons into the air each month, adding then the safety, reliability, and comfort of air travel and building up a new respect of potential passengers for all forms of air transport.

Air ferry operations are particularly significant because they demonstrate that the airplane is readily accepted when it renders a real service. Like all other aeronautical activities, they will receive public acceptance in direct ratio to the genuine economic value of the service rendered.

//

Yeast for the Mass

PRIVATE FLYING clubs are an organized force here on the whole, with certain happy exceptions here and there when tried in this country. Heralded as the vehicle by which the popular reaction for airplanes would arrive, the flying club has failed to carry its weight. If private flying is to be popularized we must have a strong and vibrant nucleus around which such flying will cluster and grow. The mass interest in flying must be kindled by the powerful yeast of a strong chain of active flying clubs.

Attempts to organize the flying club movement have run into special difficulty because we have generally gone too far afield. Most club attempts have been based on an effort to still places to a group not yet actively engaged in aviation or flying activities. If there is to be a strong flying club movement built up we should first turn within and establish such clubs among those most actively interested in, and already engaged in, aviation.

Of course the heads and executives of aeronautical concerns of all sorts should set the example by taking an active part in the flying club movement. They can afford to do it and the duty is plainly theirs. If we do not fly ourselves, we cannot expect anyone else to do so. There is available, however, a wider field for intensive flying club organization among the rank and file of the employees of all aeronautical concerns, including not only the aircraft and engine manufacturers, airport, air lines and distributors of aircraft, but also the oil companies, rubber companies, and all others closely allied with the aeronautical industry.

Such flying clubs among employees should be subsidized by the employer to the extent, at least, of supplying

equipment and training at cost. The employers would be given the opportunity of actively engaging in flying at a price within their ability to pay. The effect on the market would be to increase slightly immediate sales, naturally increase the total volume of flying, and to stimulate private flying generally through the activities of the club members and their work upon their friends. Employees would feel themselves a definite part of aircraft production as they never can on any other terms, and factory morale would benefit correspondingly.

Pricing and insurance would, of course, be handled through the employer and a direct salary levy would represent a comparatively painless method of collecting dues. The time they will come when participation in regular flying activities will be made compulsory for all employees above the very lowest ranks. All those who are earning their bread and butter through a connection with the aviation industry share a direct duty to build up that industry in every possible way. The acceptance of such a plan by the industry, and its consequent development, would give us a skeleton upon which to build a popular flying club plan extended to the general public. Any doubt or uncertainty as to the venal status or failure of flying clubs outside the aviation industry, based upon experience to date, has nothing to do with the present case. The opportunity is at hand to start a strong flying club movement. The industry can do the job. In its own interest, the industry should.

//

To Fly or Not to Fly?

FOR THE MOMENT, the passenger air lines of the United States have relatively little grievance against their traffic. On the long-run basis it is still far short of being adequate, but its proportions have increased so enormously in the last few months that there is hardly likely to be any better time than the present for trying experiments which may make slight temporary inroads upon the passenger list. With rates at their present level the air lines can well afford to lose a single passenger for a single trip here and there, if by so doing they can make a lasting friend for the future.

Air travel still falls rather badly short of perfect suitability. We freely recognize, talking among ourselves, that we cannot fly in certain types of bad weather, and that the attempt to do so would be fraught with increase of hazard. We not only recognize that fact among ourselves, but the public recognizes it, with increasing force as the number of people who have had a reminiscence on a plane and then found that it was unable to get through an adverse season with the mounting percentage of the air lines.

Since the aviation industry recognizes the fact, and since the general public recognizes it, why not, so to

speak, admit it to each other? Why not admit it before the fact instead of expressing regret afterwards?

Obviously, it is often impossible to tell in advance with any certainty whether or not a trip can be made. Equally plainly, weather conditions and the weather men often show a couple of hours before the flight, or even over-night, that it is almost certain that the flight will or almost certain that it will not be put through without a hitch. That information is now compiled and interpreted, so rapidly as it becomes available, for the operating organizations. The prospective air traveler ought to be let in on the secret.

Frequently we have had occasion ourselves, as innumerable travelers are concerned with the aeronautical industry must have done, to balance in our minds the relative desirability of taking the train to a distant city tonight or the airplane tomorrow morning. If it was of extreme importance that the schedule be made we have been likely to end up by taking the train, particularly during the winter months when bad weather is more than ordinarily common. We should have been far more disposed to wait upon the airplane, which would have been such more convenient, if we could have telephoned the office of the air line the previous evening and had a casual assurance from an apparently well-informed official that the weather maps presented no sign of trouble impending and that the chance of going through on schedule the following day was well above the average for the season.

Some air lines will give such information to the ordinary traveler now, but others, we fear a majority, will not, preferring to put off his inquiry with vague and platitudinous and obviously unimproved assurances. Admittedly, to get out the bad news when weather trouble is likely, but by no means certain, would mean the loss of certain passengers and the possible necessity of making the trip with a high load of the weather cleared up and permitted of getting through after all. We are very confident that that sacrifice would be compensated for by the increased confidence that the passengers would feel when the forecast was favorable, and by the saving by air of certain journeys at present made by rail because the weather hazard is considered too great to assume.

Admittedly, also, some care would be necessary to avoid inquiry in the nature of a guarantee, or any creation of legal liability in the event that a favorable forecast of successful completion proved to have been unfulfilled. We have enough faith in the usefulness of counsel for the air transport lines to believe that they can construct that clause. What the American people want of air transport at present is to know exactly what it can get. They would, taking them as a whole, much rather accept a reduced speed or certainty of service, provided they were warned in advance, rather than to find that implied promises had been made which could not be kept. This is a good place to start telling them, so far as our own knowledge permits, just what they can expect of each individual trip.

HERE AND THERE AT THE *Detroit Affair*

By
R. SIDNEY BOWEN, JR.
Assistant Editor of Aviation



General view showing Exhibit B-4C and Exhibit exhibits



The Consolidated and Ford exhibits. Note the suspended sky-ride in the background and the "Riverfront" in the foreground.

Thumb Nail Sketches of

the Exhibits and Activities at the Third All-American Aircraft Show

and the result is an item of considerable importance, particularly to the small manufacturer.

This year's show, however, presented the exhibitor to side step that expense, for with the exception of one or two planes, every one was flown to the airport, trimmed off, polished up and wheeled into position in the exposition building, and then, accidentally, included the Fokker P-32.

However, it seemed quite evident that what the exhibitors stood in the cost of getting their planes to the building they spent in additional thousands of their respective budgets. The Airplane Division of the Ford Motor Company, for example, set out to eclipse all previous records. One half of the Company's floor space was taken up by two Ford transports, one of them powered by Packard Diesel engines. The other half was a late's eye view of Ford Airport and surrounding territory from an altitude of about seven thousand feet. On the floor was mounted a paper mache relief map made in rock and with no detail missing from the Ford history to the telephone wires strung along the railroad track. Suspended above all that was a Ford transport with propellers turning over. When one viewed that giant transport one realized more than ever what a splendid job the engineers did when they built that man banger.

Slightly less elaborate, but perhaps equally effective were the exhibits of the Stinson Company, General Motors (Fokker) and the Detroit Aircraft Corporation. Each of these three progressive companies showed their full line, which was arranged so that there was plenty of "eye appeal." As a whole the accessory exhibits were well planned and well decorated. Perhaps it was because of the size of the show place, but anyway it seemed to me that there were fewer accessory exhibits than in shows gone by. One thing, however, that was particularly pleasing was the absence of companies that have nothing worth offering the aircraft industry. The most popular exhibit of the power-plant group was that

of the Packard company, which made its first public showing at the long awaited Packard Diesel engine. The River company also seemed in charge of attention with its novel display and the Pratt & Whitney Company and the Allison Company of America had the same amazingly decorated displays that they had at the St. Louis show.

Although official figures are unavailable at this time it is fair to assume that one aircraft show attendance records were hung up during the show period. The fact that both stationary and flying planes were on the main had a double appeal for the visitor, and he and all his relatives and friends trotted out to the show in force. It has been stated that the airport at last fifteen visitors from the business district of Detroit. Perhaps it is, if one considers it fifteen minutes by rail about. However, the port is exceedingly close to downtown Detroit and there are not to our knowledge many other points so well located. What is undesirable in distance is made up for in ease of transportation. The port may be reached by either street car, bus or taxi.

The field itself, which was described in the April 5 issue of Aviation, needs no further comment here, other

than that it is all that Detroit promised, and was operated to the entire satisfaction of the visiting planes. The flying miles were achieved to remarkably well and there were very few violations.

So much for what was available. Now for a few words regarding the extent to which the industry took advantage of the opportunities presented.

Long before the opening date it was announced that the Detroit affair would be a non-spectacular event. In order that plane manufacturers could devote major effort to getting signatures on the dotted line, or at least a list of promising trade and civilian prospects, a minimum number of trade meetings were scheduled. The airport was made available for demonstration flights, and the Show Committee arranged all sorts of attractions to get the public out to the show. The public did come out, but the industry failed miserably in its attempt to take advantage of the exceptionally unusual opportunities presented. In fact it was my impression that there was a minimum of effort on the part of plane manufacturing representatives to go after sales.

And our impression was not gained from hearsay, but from actual observation and experience. With the idea in mind of determining how the business of selling airplanes was progressing we put on our armoured tank-top off our Q.U. gun and toured the show at intervals for four days running. We climbed was planes and climbed out of them. We packed up literature and read it with interest. We patrolled propellers and perched up under the cowling on engines. We joined the American Order of Future Builders and strapped wings and warts. We did everything that we believed a prospective purchaser would do, but we received no attention, except from our friends in the industry, most of whom we succeeded in dodging during the selling inspection tour. And we went out there in that effort after another. A few of our friends did the same thing. But the result was the same. Not once were we asked if we were interested in aviation. Not once were we asked if there were unanswered questions in our mind. Not once were we asked if we would like to buy a plane. We were

TWO YEARS AGO the Detroit Board of Commerce and local aviation officials agreed as aircraft show that brought forth much praise from the industry. One year ago a second show was held, and again the industry submitted to stranded Detroit. Last week a third show was put on and the industry finds itself high and dry for the next or suitable alternatives to describe its activities of what Ray Cogen and his associates have accomplished in the Motor City. Perhaps it was the result of double experience, or perhaps it was the result of increased cooperation on the part of Detroit taxpayers, or perhaps it was the result of both. But at any rate, the Third Annual All-American Aircraft Show may well be regarded as the most attractively staged aeronautical exposition in the history of the aircraft of aviation.

For many years the industry has looked for the opportunity to show the prospect its wares on the floor of the show, and there like him outside the building and discontinue the product in the air. At Detroit the opportunity presented itself, for the show was held in the main large and spacious building at the Detroit City Airport. That, of course, was one of the main features of the affair both from economical and financial points of view. Hereafter, exhibitors at aircraft shows have been forced to fly their products to the nearest airport, knock them down, cart them through the arena of the city, and then assemble them again in the exposition building. At the 1935 Detroit show the average outright expense alone was \$40 per plane. Add that figure to the time cost of knocking down and assembling



A view of the attractive Packard Diesel display

spoken to, we admit, and on four corners. But each time it was an effort to be as courteous as to get down off a fuselage wing, and to say down. These were countless youngsters in short pants who put the same words, or after all, perhaps we do look too young to learn to fly.

But that is beside the point. Here is the world of manufacturers expect to sell their products at shows if they totally disregard the visiting public? Money came out of every hundred people who stepped behind an exhibit, perhaps had a few enough money to buy the prop, but it is fair to assume that the one hundred had enough to buy the whole plane. He, however, like the other many men, had little opportunity, if any, to learn any more about the plane than what was printed on display placards, or contained in advertising literature. And there was an alarming scarcity of this. Free price tags were few and far between.

If it is to be the style for salaried men at aircraft shows to ignore the seemingly interested public, then that public should at least be allowed to inspect the planes at close quarters, in fact at night in them if it is not desired.

Had that been the case in Detroit we feel confident that more sales contracts would have been signed and sealed. Unfortunately, though, it was not



The Holman exhibit with Lockheed in its background.

the case. At the majority of exhibits, any visitor who wanted to swing a leg over the cockpit was immediately started upon by the nearest salesman and more or less told to let it be his way. Some planes were closed hidden behind "Do Not Touch" signs. And it was personally repulsive to get into any of the exhibit pits on exhibits, for although none of them were open to inspection they were well occupied by salesmen and their industry friends talking over old times, or perhaps, the best ways to sell airplanes during 1930.

HAVING TAKEN part in more than one aircraft show, we can appreciate the worry and annoyance that thousands of untrained kids can cause the plane exhibitors, by any means of the accuracy can display small objects that fit one's pocket. However, there is an reason to adopt and enforce "The son, like father" policy. At an automobile show it is all one can do to keep out of a car, but at an aircraft show it is all one can do to get near a plane. Plane manufacturers produce all sorts of things about the maintenance of their products and at aircraft shows they would then from the hands of the public so though they would

enable like to reach due at the slightest touch. Such procedure is neither logical nor profitable.

The youngsters are so worried by the salesman on duty. And of the exhibit is too large for men then they grow more than one on the job. But let the grown-ups respect the places to their least control. Let them get in and work the controls if they wish, and while they are doing that, stand by them and volunteer a little information. It was tragic the very best old old folks who were believed in by witnesses at the Detroit function. Incidentally, sending out the youngsters for the second, it might be overlooked that the "less than 16 yr. of age, accompanied by adult" rule that was supposed to have prevailed at Detroit was broken as completely as was the treaty concerning Belgium. On Sunday the sixth, when some 40,000 persons passed through the gates, the plane was packed with kids. If all of the visitors that day were placed side by side it would be found that every third one was an ungrateful youngster carrying under his arm everything that was not nailed down.

A RELIABLE FACTOR that was missing at Detroit, and which may be considered unfortunate by many, was the presence of women salesmen. We asked that members of the fair are not from any great numbers and at automobile shows, in fact not found service in the capacity of saleswomen. Perhaps they are not needed by the automobile industry because the lady of the house has accepted the four wheel means of transportation. But when it comes to the aircraft industry, we feel that the story is a bit different. The daughters of Eve have not accepted aviation in the same manner that their husbands, if any, have accepted it. In fact we make so bold as to venture that it will be a harder job to sell air transportation to the mother of the family than it will be to the father. However, we hope that we are wrong.

Nevertheless right or wrong, it might be a good idea to have a feminine member included in the booth personnel so that the visiting ladies will be appropriately served. But if it must be a step father, who will address the lady as well as her mother? One even at Detroit, standing in line in one corner. A gentleman and a lady had, by some means unknown to us, attracted the attention of a salesman. They did even more than that. They succeeded in getting him to answer questions. The salesman, though, addressed all of his remarks to the man and not the slightest attention to the lady present. Eventually he worked the man away from the lady and began to show him some other features of the plane. The result was that the lady soon grew tired of viewing the general surroundings and began to tap the leg of one man on the floor and show her particular pleasing glasses at the salesman and his prospective customer. If that was good salesmanship then we apologize. However, the gentleman and lady happened to be married and so were willing to take any bet that a wife was ruder than her.

Although it is well known by all salesmen, and is perhaps repeating a time were far unacknowledged, we risk criticism to mention that the lady of the house has a whole lot of say on how and where the man of the house spends his money. The automobile man knew that and sells the American automobile in the way the woman wants it as well as the way the man wants it. In the design, color and interior of the modern plane there is some indication that the manufacturer is



Viewing the Holman exhibit (left), the Thrush flying boat (right), and the Holman exhibit (right).

appealing to feminine tastes. But what little appeal there is will fall off if salesman do not remember that the lady of the house needs more selling than does the man.

Speaking of sales, the Detroit show was undoubtedly freer from any other show that we have had the good fortune to attend. Usually it is reported or rumored that the salesmen's production of at least five minutes factures has been sold before the curtain falls on the third day of the show. But at Detroit it was not until the third day that a plane was even rumored to have been sold. And in this particular case the rumor was correct. A plane actually was sold on the show, believe it or not. Of course other sales were made before the lights were turned out on the last day, but one left the show with a feeling that for the first time in history show exhibitors had sold pretty close to the truth in their show sales statements.

Besides what early sales were made inside the exposition building, additional revenue was obtained on the field. The well-known pop-hopping bankers were exercising their lungs all the time, and from the observations we were able to make, a profitable one was being enjoyed by all. Incidentally, the weather during the first five days did not add to the number of dollars-hoppers. One day snow was among the elements present and for two days following that a cold raw wind helped to keep many people in the exposition building. Whether or not, but was sunny weather for April in Detroit, it might be worth the time to consider a possible later date for the holding of Detroit's annual aerial affair. Particularly in view of the fact that there will be more and more demonstration flying as time goes on.

Before leaving the flying end of the show, it might be interesting to know that it was not imperative for planes on the field or in the exposition building to leave the scene of action at the close of the show. At all other shows the exhibitors had to pack up and get out as soon as possible so the shows were held in places that are available for other exhibitors. But at Detroit the exhibitors were able to store their planes in the exposition building at

long as they wished, and only the usual hangar rental fees (based on wing span) were charged.

THERE was another thing that was quite conspicuous at Detroit as compared to aircraft shows of the past. In fact there were two things. First, the absence of many items well known in aeronautics. Perhaps some of the missing remained so because of the change that hit the industry last year. Perhaps some of them will be actually missing for many shows to come. We are inclined to believe that to be the case. But perhaps they were missing because of their reluctance to devote any more time and money to aircraft shows during 1930. Then again, perhaps they have chosen the New York show in May instead. But at any rate, there were none of the "old hands" among the missing. The St. Louis affair was a manufacturer's show while at Detroit it was frequently a case of distributor exhibiting.

The second thing was the marked decrease in aircraft show night life. In the past most every hotel room was open house to all who cared to step in. And it remained open house throughout the week. At Detroit there was very little of that sort of thing. An atmosphere of seriousness and business was prevalent from the lobby to the night-grounds. Road sales were selling for real business discussions. Whether it was due to the evening being raining, or whether it was due to the fact that new hands are on the industry's finale we can not say at this time. However, there were many Detroit hotel managers who this past season grew weary but did not get there.

The seriousness of the lunch room reminds us of a particularly important feature of the Detroit show. For years we have been cringing about aircraft shows, maintaining ourselves with hot-dogs and cheeseburgers between breakfast and dinner. At Detroit there was a well appointed restaurant, cafeteria and lunch counter right in the exposition building. What it may have lacked in quality of food it made up for with the opportunity to eat only a few after miles of cement floor and tripping over spider system outlets. Indeed we look forward with great joy to the day when an aircraft show commensurate will have a simple representation of a restaurant and a few of glass carpets. Then and then only will an aircraft show be a complete success.



A guard who of the Detroit Air Show and National Aeronautics exhibit on the 1930 4th American Aircraft Show.

PLANES, ENGINES AND ACCESSORIES AT THE Detroit Show



Inspection photograph showing the use of the Pratt & Whitney engine in the Verville Air-Craft

By LESLIE E. NEVILLE

Technical Editor of Aviation

WITH SUCH a short period of time having elapsed between the St. Louis and Detroit Aircraft Shows it is difficult to make a comparison between the two groups of airplanes in such a way as to reflect the tendencies in aircraft design. A comparison of the 1929 and 1929 All America Shows at Detroit will probably be much more enlightening. However, we are presenting in Table I a statistical study of the four groups of airplanes exhibited during the past year at Detroit (1929), Cleveland, St. Louis and Detroit (1930).

While probably the most significant development among those seen at Detroit is the Packard Diesel engine, it is difficult to predict at this time just what influence this power plant will have on the design of future airplanes. Only actual service conditions and maintenance problems will serve to show in what way the Diesel engine is to affect the technical development of aircraft. The fact that six of the 75 airplanes at the Detroit Show and several on the field were equipped with the Diesel engine serves to indicate the interest so far evinced by engineers in this significant development. A detailed description of this power plant by Edward P. Warner, editor of Aviation, was published in the April 30 issue.

Regarding the more conventional engines at the aircraft show, there are several apparent tendencies that are worthy of note. The first of these is the increasing number of supercharger-less, air cooled types of four and six cylinders and much increasing exposure to inter-

to bring new power plants in this class to light. Secondly, the development in gearing and supercharging, as shown by the complex line of American Cornish Engines, Inc., are of interest. This company displayed was only the vertical American Cornish but an inverted design of similar characteristics which is available either in normal form, with supercharger, or with gearing. The gearing is of the internal type and provides for several ratios of the propeller. It is completely built in as part of the engine. It provides a propeller shaft rotation of $\frac{1}{2}$ engine speed. The DePauw supercharger is to be available as a separate unit or as part of the engine in a quickly and easily detachable form. It is of the positive pressure type and is available on both the American Cornish (vertical) and American Ranges (inverted) types.

The two "L" head engines at St. Louis were absent at Detroit.

One of the most striking features of the Detroit exhibit was the evidence of the gradual transition from wood to metal. Notable among the examples of this are the Lockheed Vega, which was shown with all metal fuselage, and the Stearman Autocrat, which had a welded steel and aluminum alloy tube wing structure. While the majority of metal structures employed riveting or welding as a method of fabrication, two of the water craft, the Eastern Flying Boat and the Keystone Landing Converter, had beehive hull structures.

Although the percentage of amphibians and seaplanes has increased only slightly since the 1929 Detroit Show, it is significant to note that the group of water craft designs among the machines shown this year included a large proportion of the seaplane and amphibian types. The problem of engine location and power distribution in the water craft does not seem to be settled, although most of the newer developments had engines above the wing housed in suitable streamline cowlings, and the group was about equally divided as regards single or twin engine types.

A substantial increase in the percentage of mono-

planes is shown despite the fact that there has been almost an equal increase in the proportion of open amphibians. The strictly seaplane type has dropped in proportion from 4 to 1 per cent during the year. The single engine craft still lead in the extent of

80 per cent and the new amphibians have added the twin engine group slightly. For the first time during the exposition under consideration a four-engine airplane, the Fokker F-32, was shown. This, moderately, attracted considerable interest as the country's largest commercial land plane and, while the machine under consideration was not the standard transport model, it showed an excellent interior arrangement for the class type of plane.

The popular three-plane machine seems to be disappearing gradually in point of numbers, as shown by the drop from 29 to 17 per cent during the period elapsing between the two Detroit Shows. Instances, however, are noted in the four-engine group and in the airplanes accommodating twelve or more persons.

Regarding power plant types, the radial group have dropped from 90 to 79 per cent and the CIX-5 powered group from 9 to 3 per cent. Increases are noted in designs powered with inverted engines and in the group of planes powered by engines above 200 hp. This latter advances an effort to attain increased performance from greater reserve power and also a possible tendency toward the commercial transport type of craft. Low wing monoplanes have increased from 6 to 9 per cent.

Regarding very radial engine cowlings, which were conspicuous by their absence at St. Louis, were very much in evidence as a number of airplanes at Detroit. Not only the N.A.C.A. variety, but others of the British Townsend ring type, were shown on a large number of airplanes in the exposition building. The new cowling ring developed by the Pratt & Whitney Co. for its Wasp Junior engine made its appearance on several airplanes, while a modified N.A.C.A. cowling with an exhaust ring built into the front or entrance portion was shown on the new Delt Airspeed. Fuselages of circular section designed to conform with N.A.C.A. cowling requirements were observed in large numbers, some being of the monocoque or skin stressed type which seems to be growing in popularity, while others



The Boeing F3B biplane, one of the large number of exhibition craft exhibited

All-American Exposition and a Comparison With the Past

Type	Detroit Show 1929		Cleveland Show 1929		St. Louis Show 1930		Detroit Show 1930	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Total planes exhibited	386	100	54	100	54	100	35	100
Monoplanes	48	12	10	18	44	82	40	114
Biplanes	42	11	10	18	33	61	28	80
Triplanes	1	0	1	2	1	2	1	3
Amphibians	4	1	2	4	1	2	1	3
Open planes	55	14	11	20	45	83	40	114
Closed planes	47	12	10	18	31	57	28	80
Land planes	80	21	11	20	41	76	31	89
Amphibians, flying boats	2	0	2	4	2	4	2	6
Amphibians	2	0	2	4	2	4	2	6
Single engined	30	8	14	26	31	57	34	97
Twin engined	1	0	2	4	2	4	2	6
Three engined	4	1	0	0	3	6	4	11
Four engined	4	1	0	0	2	4	1	3
One plane	4	1	4	7	2	4	2	6
Two planes	12	3	16	30	26	48	28	80
Three planes	29	8	10	18	31	57	28	80
Four planes	11	3	3	6	12	22	16	46
Five planes	1	0	1	2	1	2	1	3
Six planes	1	0	1	2	1	2	1	3
Seven planes	2	0	0	0	3	6	4	11
Eight planes	2	0	1	2	1	2	1	3
Ten or more	2	0	2	4	2	4	2	6
Rated engine above 200 hp	30	8	11	20	36	66	34	97
Vertical in line or radial	80	21	1	2	5	9	2	6
Open	1	0	1	2	1	2	1	3
Detachable in line or radial	1	0	1	2	1	2	1	3
Water cooled, inline type	—	—	—	—	2	4	2	6
Detachable	—	—	—	—	2	4	2	6
GE	1	0	0	0	5	9	4	11
5-50 hp	1	0	2	4	5	9	4	11
10-150 hp	14	4	11	20	17	31	16	46
150-200 hp	11	3	8	15	12	22	16	46
200-250 hp	11	3	8	15	12	22	16	46
More than 250 hp	17	4	17	32	16	30	16	46
Low wing	4	1	6	11	6	11	2	6
Medium wing	2	0	2	4	2	4	2	6
High wing	2	0	2	4	2	4	2	6

THE CONSOLIDATED

"Fleetster"

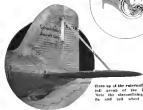
Detail sketch showing attachment of the tail wheel mounting bracket.



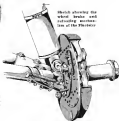
The partially covered fuselage structure showing the construction details of the low wall.



Sketch showing the wheel hub and axle mounting mechanism of the Fleetster.



View up of the rearward end of the Fleetster. Note the attachment of the tail wheel mounting bracket.



AVIATION
April 25, 1938

AVIATION
April 25, 1938

The fuselage structure of the F-14 with landing gear.



Photograph of the fuselage structure. Note the method of securing control rods and wiring.



Detail sketch of the main landing gear and its attachment to the fuselage.



THE FOKKER
F-14



Sketch of the fuselage structure showing the attachment of the landing gear.



Sketch of the fuselage structure showing the attachment of the landing gear.

riest spacing is such that the faulding itself is reasonably water tight as an emergency measure.

Similar construction is again employed in the engine mount. This mount is crucial in shape and complete access to the rear of the engine may be had through doors in the fire wall. A Goodenough air wheel rigidly mounted across as a tail wheel. The wing is of internally braced wood and plywood covered construction. All tail surfaces are of metal construction.

An interesting addition to the two place tandem biplane group was the Grondy Monomote two-place training airplane covered with a four-cylinder inverted "Grondy 300" engine, which develops 100 hp. at 2,300 r.p.m. The plane had a welded steel Cabane and an internally braced stabilizer. In other respects it follows the conventional type of construction.

The aluminumized tendency toward metal construction is also reflected in the introduction of the metal Lockheed Vega model in the exhibit of the Detroit Aircraft Corp. This plane is almost identical in appearance to the standard wooden machine and has approximately the same weight empty. The wing and tail surface construction, as well as the general outline of the plane, are standard Lockheed Vega units, while the faulding alone has been changed from wood to metal. The metal construction of the faulding has been simplified so that the skin can be applied lengthwise in long formed sheets and riveted to the stringers. T-section aluminum alloy members are employed in the seams and provide both longitudinal stiffness and finish to the exterior, since the skin sheets are riveted to the lower side of the cross member of the T-section, leaving the cross member on the outside of the structure.

To form a finishing

coat. The skin is .028 aluminum alloy sheet. Use of metal may be extended to wing and tail surface construction at such future date. Other features of the Detroit Aircraft display were Dowl powered planes, including the Euzenn flying boat and the Ryan Firestorm, as well as the new Ryan Speedster which appears to be a de luxe edition of the Perko P-11 three place open cockpit biplane.

For the first time in its history the Fokker Aircraft Corp. division of General Motors Co. displayed its entire line of aircraft. In addition to the F-32, which is the most recent member of the group, a de luxe model of the Sigsbee F-10 co-motor, the Hornet powered F-11 seaplane, the F-14 mail and passenger plane and the Universal and Super Universal constituted the display. Probably the outstanding feature was the specially designed F-32 which has been built as a flying office and home for L. P. Fisher. This craft contains living room, smoking room, sleeping compartment with full



Section of a portion of the fuselage showing the placement of the engine and fuel tank.

size berth for four, a fully equipped office and a galley having cooling and refrigeration facilities. It is designed to carry fifteen passengers by day or for a fully equipped home for four people. The latest type of two way radio telephone set designed by Western Electric in cooperation with Herbert Hoover, Jr. of Western Air Express is installed to provide communication with the ground.

The technical details of the Fokker F-32, the Universal, Super Universal and F-10 have been presented in detail at various times in *Aeroplane magazine*. The F-11 seaplane has also been mentioned in the January 5th, 1929 issue. It is interesting to note that the metal hull of this craft is built at the Holland factory of the Fokker Company and the wing is an American product bearing all of the characteristics of Fokker design.

Designed to conform to the provisions of the Waterfall F-14A mail plane has a standard Fokker wing and is the only one of the group that is of the parasol type. This is necessitated since the pilot sits well back toward the tail of the plane in contrast with the position in other Fokker models. Mail or passenger or beds can be transported in the forward portion of the fuselage.

This plane is powered with a Pratt & Whitney 525 hp. Hornet engine or a Wright Cyclone. The cabin interior is finished throughout in duralumin and is painted and arranged in such a manner that it is readily convertible for mail, baggage or passenger use. A lavatory is located between cabin and engine compartment.

The tail wheel is axially mounted yet always remains straight when in flight due to an ingenious spring arrangement.

Undoubtedly the Fokker exhibit was outstanding because of the attention paid to color coordination in both exterior and interior finish of the airplanes. Credit for this is due to the long experience of Abraham Lincoln Cooper, color expert of the General Motors Export Division.

FOUR PLACE metal monoplanes amphibion constituted the exhibit of the Deaton Aircraft Co. This plane is not strictly all metal in that the wings and part of the faulding rear of the passenger compartment are covered with fabric.

The plane is an externally braced monoplanes using an airtail developed by the company. The covering of the tail is constructed of formed sheet metal, and the hull and center section are covered with "Hyb-lon" an aluminum alloy developed by the Sheet Aluminum Corporation of Jackson, Mich. The craft's retractable land-

THE SIKORSKY

S-39

AMPHIBION



One of the wing bracing is mounted outside the wing section.



Sketch of the fuselage section showing the placement of the engine and fuel tank.



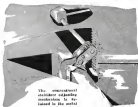
Sketch showing the airtail and the internal structure of the tail.



Sketch showing the retractable landing gear mechanism.



Interior view of cockpit arrangement

The universal
cable-actuated
mechanism is re-
tained in the metal
deckboard section

THE METAL *Lockheed*

Sketch showing the
cable-actuated
mechanism in the
landing gearSketch of metal
cable-actuated
mechanismSketch of metal
cable-actuated
mechanism in the
landing gearSketch of metal
cable-actuated
mechanism in the
landing gear

ing gear is hydraulically controlled by means of a hand pump in the compartment, and when retracted the wheels lie horizontally along the fuselage. The wheel track is 8 ft. Of the two planes shown by E. M. Laird Company of Chicago the most recent is the Speedwing model of last year. This year's plane was fitted with the Pratt & Whitney 450 hp. Wasp engine. It was a three-place open cockpit biplane with typical Laird lines and has many interesting refinements.

In addition to this plane, two of the Laird standard models were exhibited.

Representing the new design, three required groups, the "Chapley," exhibited by the Dayton Associated Corporation of Englewood, Ohio, attracted attention. The Chapley is a six-place cabin monoplane following conventional construction practice. It was an exceedingly well finished machine.

It is interesting to note that one company whose production had been devoted to open biplanes introduced a closed monoplane at the show. This machine, a Whitcomb Seven, four place, cabin monoplane which was rushed to completion for the exhibit by the Spartan Aircraft Co., is for the most part of conventional design with the possible exception of the landing gear. The upper end of the vertical shock strut is attached to the fuselage while the lower end terminates in a fixed wheel mounting. The entire unit is enclosed in streamline fairing. This results in an unusually clean landing gear. The wing design is noteworthy for its relatively high aspect ratio. It is well finished, both internally and externally.

Bearing a striking resemblance to its predecessor the Sikorsky S-39, four place cabin monoplane amphibian was introduced at the show. This S-39 is powered with a Pratt & Whitney Wasp Junior.

The S-39 has an all metal hull consisting of metal framework covered with Alclad dural. The streamlining and the V bottom of the hull follow conventional Sikorsky practice. The new plane has a wing of metal and fabric construction. The demountable lower wing of the S-39 has been replaced by a system of horizontal "H" struts in the S-39.

The hydraulic retracting system for the landing gear operates the wheels either separately or simultaneously.

Although not displayed in the exposition, building the new Corsair Airliner introduced by Sessom was of interest. The plane is powered with three Lycoming radial engines, model R-680. These engines are rated 210 hp. at 2,000 p. m. Electric and hand crank starters are standard equipment.

The primary structure including the wing of the "Airliner" is of metal, while the plane is completely fabric-covered. Metal wiring is used on the wheels and the outer engine compartment back to and under the pilot's compartment. The fuselage is completely welded of chrome-nickel steel and tubing.

Spars of the Airliner are of steel tubing construction. Compression members are of brass construction built of steel tubing. The rib area of square framework tubing held together by dual gusset plates and rivets. The

The internal bracing of the York Amphibian wing before
completion. Note method of riveting working between
the struts

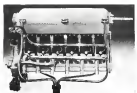
leading edge of the wing is a dural tube which serves as a channel for the electrical wiring. Dural fairing covers the leading edge back to the front spar. All control surfaces are of steel tube fabric covered construction.

A club plane similar in appointments to the one exhibited at St. Louis but far more attractively finished, particularly on the exterior was shown by the Stout Airplane Division of the Ford Motor Co. The metal exterior was beautifully finished and the propeller

The steel landing gear cable-actuated
mechanism developed by the E. M. Laird Co.Sketch showing the construction of the
cable-actuated landing gear. A sliding
cable is in the right position for the
cable

blade tips were finished with red, white and blue colors. The Towle flying boat, Model 7A-3, was completed just before the show. This plane was of 8 place capacity, and powered by two Packard Duard engines placed above the wing. It is soon to be available as an amphibian.

This machine is built entirely of metal and careful workmanship is one of its characteristics. It is also noteworthy for its unique wing structure. In principle, the external framing of the Towle wing may be called an elongated rib section extending from root to tip. Instead of being composed of a number of small ribs assembled into a rack and spaced several inches apart,



Side view of the Chrysler 200 hp Model B-6 Chrysler inverted engine

the wing has a single corrugated sheet, zigzagging through the section from root to tip, and attached to the skin at the lead. This corrugated portion of the wing sheet between the bend acts as the basic webbing of ordinary ribs.

Two wing struts of male and female sections, extending along each bend, and between which a flattened portion of the corrugated sheeting passes, act as spar flanges. The combination of webbing and struts is designed to take the place of spar ribs.

Waco exhibited a new Model 3 biplane which they will add to their line of commercial planes. The Model 3 is a three place open cockpit biplane, smaller all around than other Waco Models. The buyer is given a choice of either a Kinner or a Warner Engine.

THE OVERHAULING FEATURE of Chevrolet Motors, Inc., exhibit was its new six-cylinder, inverted, air cooled engine which is similar to the company's four cylinder engine. The D-6 develops its maximum hp., 190, at 2800 r.p.m. and delivers 170 hp. at 2600 r.p.m. It has a bore and stroke of 4 1/2 in. and 5 1/2 in. respectively and a displacement of 329 cu in. The crankshaft is 3 in. in diameter and has seven bearings. All oil passages are drilled or bored and a valve allows for a change from dry to wet sump system should no oil line be broken. Ignition and carburetor are furnished by dual Holman Bosch magnetos and dual Stromberg carburetors. Continental Aircraft Engine Co. exhibited two of its Model A-70 engines. One of these engines was completely sectioned to show all operating parts and the working parts of the engine were carefully kept in position by an electric motor.

No new models were introduced at the Detroit Show by the Warner Airplane & Motor Corporation. They

had on display their standard K-5 100-hp. engine, and also one of their R-712 190-hp. type, the latter having been introduced at St. Louis. Licensing displayed its new three cylinder model.

A two-stroke cycle, two-cylinder opposed engine was exhibited by Chase Motors and its use in connection with gliders suggested by the manufacturer. The engine is of the two-port type and rated at 35 hp. at 2700 r.p.m. The weight with propeller is 32 lb. An engine of somewhat lower power is also included in the production plans of the manufacturer.

The latest improved models of the 66 and 99 engines were shown in the Leffland booth. The most recent model has been conservatively rated 85 hp. at 2125 r.p.m. Pratt & Whitney Aircraft Co. exhibited their "full line" of air cooled aircraft engines at Detroit. Their exhibit was sponsored by the State Airlines Inc., their authorized dealers in Detroit and Cleveland. As at St. Louis, the feature of the exhibit was a 300 hp. Wasp Junior with the new cowling and cowling.

Warner Aircraft Co. had on exhibit their standard five- and seven-cylinder radial engines. The latest of these was the five cylinder Scarab Junior, introduced at St. Louis and described at the same in *Aviation*.

THE SPARK PLUG COMPANY of Flint, Mich., exhibited a complete line of 3160 spark plugs graded according to heat range.

Two new instruments shown by the Pioneer Instrument Company division of Bendix Aviation Inc., were a fuel flow meter and a fuel level gage. In addition, all of its other instruments with minor improvements added to many cases, were shown.

Berry Brothers displayed a complete color album. This consisted of fifteen oil paintings of airplanes, show-



The D-6 Chevrolet engine with 700/700 horsepower as shown by American Motors Engines, Inc.

ing them finished in attractive color schemes. In addition a large number of model planes were finished in attractive colors and designs. A long pursuit of particularly bright plumage was a feature of the display.

A display of alloy steel and special heat treated steels of airplane quality were exhibited in Booth No. 14, on Regatta Avenue by the Bethlehem Steel Company of Bethlehem, Pa.

Edo Aircraft Corporation displayed its line of floats with a complete set of pictures showing the line of American bank airplanes equipped with them. In addition, they had one of their Model 5300 floats, which is used as standard equipment on the Lockheed Air Express and the Consolidated Fleetwing. A canopy section of one of their new series floats was on display, pro-



THE OGDEN "Osprey"



The winged type of elevator control mechanism installed on the Osprey float.



Adjuster adjusting gear in the tail.

Photograph of the structure of one of the engine nacelles.



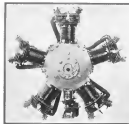
Structure showing the internal layout of the nacelle, which is built up of some plates.



Two wheel construction details showing the main wheel mechanism and shock absorber unit.



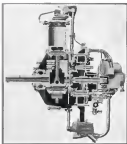
Detail showing the internal structure and the supports for the nacelle.



Front view of the Warner Scarab Junior engine



Detail showing the valve train



A perspective interior view of the Scarab Junior.

THE WARNER

"Scarab Junior"

AVIATION

April 10, 1939

ing a clear view of the die stamped bellhead and fittings, and the other interesting details of construction.

The Elgin National Watch Company, Instrument Division, exhibited a complete display of all the aerodrome instruments of its manufacture. Notable among them were the Elgin Avigo compass, the airspeed indicator, the altimeter, Elgin Avigo clock and the ball bank indicator, together with an A. N. standard size chrometec instrument.

The General Electric display was much the same as that at St. Louis with one exception. This was the standard 1,800 watt Department of Commerce radio range beacon transmitter. This beacon is an aerial type.

Representatives of a complete line of small tool equipment for automotive and aircraft maintenance work was an evidence in the display at the Greenfield Tap & Die Corporation. A feature of the exhibit was the No. 3438 spiral expansion runner with a specially designed aircraft pilot.

Two new propeller models were introduced by the Hamilton Standard Propeller Corp. and designated Sport Junior and Sport Senior. The Junior is designed for engines at 60 to 90 hp. and has diameters from 5 ft. 6 in. to 7 ft. and a weight range of 25 to 27 lb., while the Senior is intended for engines of 90 to 115 hp., diameters of 7 ft. to 8 ft. 4 in. and weight range from 35 to 37 lb. A new wood propeller of conventional design was introduced by the Kart-Ross Propeller Co. of Sioux City, Iowa.

The Haskelite exhibit consisted of samples of Haskelite and plymet, used in aircraft fuselage, landing edges, engine floorings, walk ways, wing skins, wing beams, seats and other places where they are adaptable.

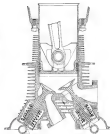
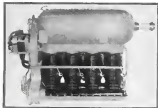
The Imperial Brass Manufacturing Co. displayed much the same equipment as at the St. Louis Show. One exception was a new cabin toilet which they have installed on the new Ford plane.

INTERNATIONAL NICKEL Co. of New York exhibited various castings and machine parts made by Standard Engine and Accessories Company throughout the nation, using nickel steel and nickel cast iron. The Skelly Oil Company had a model of a Spartan biplane at the Exhibition which contained much innovation. Using an electric refrigerator to simulate atmospheric conditions they also gave a demonstration of their oil flowing at temperatures below zero.

Included among the material exhibits was a group of Nitroflex standard buildings, tools and precision parts.

THE CHEVROLET D-333

Perspective view of the Chevrolet D-333 showing general arrangement of accessories.



Perspective view of Chevrolet D-333 showing general arrangement of accessories and valve system. This was a prominent feature of the Detroit display.



The S-K crystal control circuit with accessories for short wave work shown by Weston Exhibit Co.

An interesting exhibit showing the uses of magnetron alloy, was sponsored by the Dow Chemical Co.

The center of attraction of the Stromberg booth was a complete carburetor service tool kit. This kit is intended for the use of both runway operators and those servicing Stromberg carburetors. The equipment consists completely in a special metal box handy for shop use.

A model drive-bench complete in every detail and actually drawing tubes was the exhibit of the Sumnerhill Tubing Company. In addition the booth contained a Radac cut-off machine which was demonstrated throughout the show.

The United States Rubber Company showed a complete line of new low-pressure airplane tires. These tires are of standard construction but designed to give the plane the advantage of reduced resistance and increased ground contact. The tires are designed to operate at a 20-lb. inflation pressure.

The display of the Westinghouse Electric & Manufacturing Co. centered largely around Nicorats and its applications. In addition it included a complete line of wind and motor-driven generators, aircraft floodlights, and hollow-bore vacuum standards. Notable in the display was the new vacuum marker for transmission towers. This marker consists of six No. 100 tubes of rugged construction. The tubes are powered in series, and each is protected by an automatic cut-out in such a manner that the marker remains in service as long as one tube remains active.

The Willard Storage Battery Company displayed a new type of aircraft battery. This battery was an outgrowth of their SAE No. 36 battery, which has been used in many planes equipped with landing lights. The Standard SAE No. 36 battery was originally designed for military service so as not to show any leakage in its upside down position. The new battery has been designed not to show any leakage in a 90-deg position, and it will not spill when turned upside down. This is quite sufficient for ordinary commercial work and results in a saving of approximately 10 lb. in weight, as compared with the No. 36 battery. Complete model shielding is provided.



Photograph of the newly exhibited special Willard aircraft battery.

HOW THE Operators LOOK AT AIRCRAFT

Discussed by the S. A. E. at Detroit, along with Superchargers, Gliders, Diesel Engines, and other matters

By EDWARD P. WARNER
Editor of AVIATION

ALTHOUGH somewhat less vied in scope than the sessions at St. Louis in February, the Detroit meeting of the S. A. E., held on Tuesday and Wednesday of the above week, drew a very satisfactory attendance. There were several general engineering papers and descriptions of outstanding new devices, such as the Packard-Diesel engine and the Conquest Tanager; and also a very comprehensive account of the deductions of the aerodynamic engineer and engine designer as viewed by the operator. Mr. E. P. Lott, manager of operations of National Air Transport, and Mr. Wesley L. Smith, superintendent of the Eastern Division of the same company, collaborated in "Airspeed and Engine Requirements from an Operator's Viewpoint."

An operation of both monoplane and biplane, including a certain number of multi-engine machines and of both air-cooled and water-cooled engines, although of N. A. T. were peculiarly well-suited to offer answers.

Emphasizing a lack of proper mutual understanding between manufacturer and operator as a fundamental cause of difficulty with flying equipment, the authors expounded any suggestion that it was up to them as operators to lay out a complete prescription for the design. They preferred to leave that responsibility with the designer and to make their own side a helpful and critical one, but they "believe that it is vitally necessary for the designer to spend a short while in the field in personal contact with the day-to-day operations, including the overhead and major type requirements, to gain insight into the problems that no amount of correspondence and conference could serve to give him."

The paper treated of a great variety of subjects and passed only momentarily on each one. The most general criticisms applied to failure to supply full operating equipment with the plane.

Cowling poses trouble both because of cracking from vibration and because of difficulty of removal to get at any interior parts. There must be protection against friction and against relative movements between the various cowling fastenings. Shroud-showering must should, judged by the authors' experience, be used on motor nacelles to keep out vibration. The space between the rear of the engine and the fire wall, for which neither the engine nor the airplane design team assumes full responsibility, is found often to be a wilderness of pipes and wires jumbled up with each other. Fuel systems led by breakage and fuel by vapor lock. They are prone to

contain too many loose connections. After much redesigning, National Air Transport has developed a fuel pressure satisfactory for their use. The pressure release valve is still a source of occasional trouble, but has been much improved in consistency of performance by a change from a ball valve to a poppet type.

Adventurous engine fuel consumption is based on dynamometer trials and are commonly, says Mr. Lott, distinctly superior to the results obtained in practice. The pilot cannot run the engine for the extreme economy without danger of getting the mixture too lean and burning valves. On radial engines there is particular danger of starving one or more cylinders because of imperfect distribution.

The paper mentioned a high altitude test in progress, intended to be the most reliable of aircraft necessities.

The general electric system of the plane now being constructed, the authors argued that light weight could not be the goal of the airplane, as it already does in Stearman and planes

APPLAUS STRUCTURE was criticized not for inadequate strength, but for propensity to wear. It was especially urged that removable linkages should be used in all cases where there is relative motion between parts, and that ball and roller bearings should be made more extensively employed, particularly in the control systems, which were reported as present "too flexibly shake themselves to pieces." Anti-friction bearings were also highly commended for wheels.

Mr. Lott and Mr. Smith, both as veteran pilots themselves and as responsible for the safety and comfort of the pilots in their organization, are naturally concerned about conditions in the cockpit. They strongly objected to the present complexity of controls and instruments there, and recommended that the cockpit should have a

rigid frame with the wooden parts of all controls hidden behind the cockpit walls and only the actual operating levers coming through.

Operators want to be able to drain all moisture in the fuel line while the plane is in flight, and also to have some means of keeping out of the outboard gas, or else passing through the jet without clogging, the drops of water which condense out of the air on the inside of the fuel-air bowl. Improved means of heating the air are sought, and so is a greater mechanical solidity in the fuel-injection to insure against their collapse by vibration. Mr. Lott made favorable comment on the down-draft carburetor, owing to the possibility of putting the air scoop on top of the engine and reducing the amount of dirt picked up in feeding.

A very novel suggestion was made on temperature control, the authors proposing that the usual oil thermometer be supplemented by a series of thermocouples connected into various parts of the engine, the pilot being able to switch from one to another and read all the temperatures at once.

A strong desire for improvement in lubrication was voiced. Means of warming the oil before starting the engine without removing it from the plane are particularly wanted. Oil coolers are considered too complicated and radiator-type lubrication takes too long and must be done too often for the operators' taste.

In matters, special attention was called to the desirability of making a larger use of the S. A. E. standards for interchangeability, and Mr. Lott went further to suggest that the operators could well agree among themselves on a general standard for a typical auxiliary cockpit layout. Almost all of the points treated had borne upon maintenance. A criticism of quite another type was directed against vibration, which was considered satisfactory in most present-day airplanes and which grew worse with the addition of cowling.

The discussion, which bore largely upon conditions of engine operation, was introduced by Mendenhall Ware of the Conquest Company with a protest that the manufacturers could hardly be expected to rectify deficiencies without knowing what they were, and a plea to the operators to make their criticisms both plain and specific. His experience had been that a pilot's familiarity with an engine was likely to be considered purely ornamental, and when new material was required

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A Typical Record of Work Done on a Plane During Months (Continued)

it was often described by the operator during it is terms entirely incomprehensible to the manufacturer.

Mr. Cranston of the Allison and the present writer raised several questions about the practice of running the engine at 20 per cent below its rated r.p.m., or about one-half its rated power, in cruising. Both believed that an engine that would start on 20 per cent that had been given too high a rating and that the rated power should represent a condition of permissible steady operation, when some increase in life would result from cutting down the steady output. Mr. Lott agreed that they would be glad to run the engine at higher power, but had in practice found that they could not do so with present-day engines without getting into trouble. The Bureau of Standards, said Dr. H. K. Cummings, would be glad to require that acceptance tests for approved type certification be made at full power throughout, if that would be acceptable to the industry and to the operators. J. T. Harrison of the Conquest Engine Company wanted to know if the operators would be interested in having purely commercial engines, designed independently of military type and capable of running 500 h.p. between overhauls. Mr. Lott warmly welcomed the proposal.

A Pratt & Whitney engineer remarked upon the unusual variety of practice among operators in respect of the length of time that their engines were allowed to run between overhauls. For Whips the period was in some cases as short as 200 h. but in others as long as 500, with a prospect that even that might soon be raised.

Their had been some suggestion that military and commercial conditions were very widely different, but Commander Miles of the Navy mentioned the differences

by reporting that military engines were being operated at about the same r.p.m. as those of N.A.T. and that the same sorts of operating troubles and the same problems of inaccurate descriptions of troubles encountered in the field were present. He expressed surprise that the criticism had not been mentioned by the authors. The military services, and especially the Navy, found some of their own difficulties on that score.

The Curtiss Tanager's Arrangements

THE PAPER by T. P. Wright, Chief Engineer of the Curtiss Aeroplane and Motor Company, on "The Development of a Safe Airplane The Curtiss Tanager" contained much material with which the readers of *AVIATION* are already familiar through the descriptions published in this magazine (February 8, 1930). Mr. Wright, however, gave out much more information than had previously been available, giving the basic aerodynamic characteristics of the plane and especially upon the wind tunnel work that preceded its design. The tunnel tests served both to determine the general aerodynamic form and to determine the loading to be used in making stress analysis for such unusual features of the construction as the floating ailerons and the retractable aileron forming the slots. The maximum lift coefficient of the basic airfoil section used, the C-72, was 0.0229 on the familiar h -per- q - c , mph, "engineering" units. With the wing closed and the flaps down a 32 deg. the figure was increased to 0.0464. With the flaps neutral and the slots open it went up to 0.0575, and with both slot and flap in action to the fullest extent, the increase was to 0.0626. The slot and flap therefore appear to be quite unimportant in their action, their combined effect in increasing the lift coefficient being almost exactly (within one per cent) the sum of their independent effects. The effect of the slot on the drag coefficient was relatively small, while the flap increased the maximum drag by some 400 per cent, that of course being in accord with general past experience. The completed model showed a maximum L/D of 10.66.

Unfortunately, no data were given on the tests of lateral and directional stability of a model with the floating ailerons and the slots operating. Mr. Wright admitted in the discussion that the saving moment due to the ailerons was in all cases small, and was likely to be positive, rather than negative as with the ordinary ailerons under normal flying conditions. An interesting point on general design was implied in the remarks "No special problem existed in the design of the tail surfaces of the Tanager." It had been generally believed by those who made a preliminary study of the conditions of the requirement that the design of controls and stabilizer surfaces for proper longitudinal behavior would be a very serious one.

Superchargers

THE ENGINE DESIGN was opened with Dr. Sanford A. Moss' discussion of geared centrifugal superchargers. Dr. Moss, who has of course been active in the design of this equipment for more than a dozen years on behalf of the General Electric Company, has been conspicuous in the Army's first supercharger tests at McCook Field, summarized the history of the device and the way in which the present engine supercharger had been developed from the familiar centrifugal compressor. Dr. Moss warned his audience against the idea that a supercharger could be built into any engine as an accessory. For best results the engine must be fundamentally



What an N.A.T. Pilot Thinks About:

1. Right flap closed. 2. Right flap open. 3. Radio control for ailerons. 4. Air outlet. 5. Engine. 6. Engine. 7. Engine. 8. Engine. 9. Engine. 10. Engine. 11. Engine. 12. Engine. 13. Engine. 14. Engine. 15. Engine. 16. Engine. 17. Engine. 18. Engine. 19. Engine. 20. Engine. 21. Engine. 22. Engine. 23. Engine. 24. Engine. 25. Engine. 26. Engine. 27. Engine. 28. Engine. 29. Engine. 30. Engine. 31. Engine. 32. Engine. 33. Engine. 34. Engine. 35. Engine. 36. Engine. 37. Engine. 38. Engine. 39. Engine. 40. Engine. 41. Engine. 42. Engine. 43. Engine. 44. Engine. 45. Engine. 46. Engine. 47. Engine. 48. Engine. 49. Engine. 50. Engine. 51. Engine. 52. Engine. 53. Engine. 54. Engine. 55. Engine. 56. Engine. 57. Engine. 58. Engine. 59. Engine. 60. Engine. 61. Engine. 62. Engine. 63. Engine. 64. Engine. 65. Engine. 66. Engine. 67. Engine. 68. Engine. 69. Engine. 70. Engine. 71. Engine. 72. Engine. 73. Engine. 74. Engine. 75. Engine. 76. Engine. 77. Engine. 78. Engine. 79. Engine. 80. Engine. 81. 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engineers. The general tendency has been to follow German practice almost unquestioningly, or at least to develop by trial and error certain combinations of design which were then held as a trade secret within the organization where they originated. In his extended treatment of "Glider Design" in this *Aircraft* section, William J. Perfield of the Shad Engineering Laboratories and of the University of Detroit lifted the veil.

Mr. Perfield viewed the present spread of these designs and construction based on inadequate engineering knowledge with frank alarm, especially taken in conjunction with the increased use of air-towing to very considerable altitudes and at considerable speeds. He regretted, as Aviation has done editorially, the present scientific factory state of knowledge upon the precise conditions to which a glider is subject.

Starting with consideration of a primary glider and with the assumption that such a machine will weigh 200 lb., or a little less, Mr. Perfield calculated the necessary wing area at from 160 to 175 sq. ft., as he considered that the wing loading should remain very close to two lb. per sq. ft. His recommendations for an airtail were for a high coefficient, good maintenance, and a thickness of about twelve per cent of the chord in the case of a primary machine with some external bracing. The Clark Y and U.S.A. 330 were noted as particularly suitable together with several of the Göttinger sections.

The problem of balance is serious, since the center of gravity of the pilot's body must be approximately at the leading edge of the wing in order to keep the total center of gravity far enough forward for proper longitudinal stability. Variations in the pilot's weight may shift the center of gravity to extreme cases as far as such as it is. It was suggested that an adjustable seat be used to balance the center for all pilots would be exceedingly desirable.

While Mr. Perfield accepted the open-luggage type of primary glider and recognized an advantage for mounting pilots and for easy repair, he spoke very favorably of some recent proposals as of a closed type of construction which would permit enclosure of the pilot's body after it had passed the very earliest stages of its construction. Such a device is now in use by one of the German clubs, and is reported to decrease the gliding angle of the ship from one in eight to one in twelve.

A number of the audience received a surprise when the author came out in advocacy of automobile towing in preference to shock-cord launching for instruction. He considered it safer and less confusing, owing to the absence of violent acceleration, to lead the glider to the launching of electrically shock-started flying controller handspins, the necessity of collecting a large launching crew and keeping them hard at work. The anomaly for extreme caution in starting novices in auto-towed flight was of course emphasized. The speed of the vehicle must be closely controlled to keep the machine from getting too far in the air on the first trials.

Mr. Perfield favored a simple sled landing gear, such as that on the German Zögling, especially when landing is to be by shock cord. Shock absorption above the sled is possible and would be very helpful, but types so far proposed were not recommended. The most severe stresses in the landing gear are in crosswind or side-slip landings, as there is little lateral raising for the sled. A point particularly stressed, and likely to be overlooked by those accustomed only to the power airplane, is the need for a continuous curvature of the runner on the

bottom of the sled to permit at times it as a rocker and varying the angle of attack at will during the take-off.

When auto-towing is to be used, a wheel landing gear is very helpful. A 16 x 7 in. wheel running at about a 5 ft. height was suggested. Whether with wheels or with sleds, Mr. Perfield recommended that the normal ground angle of the machine should not exceed 12 degrees, thus reducing the liability of stalling during a take-off. In the fuselage design a major consideration is the ease of assembly and transport, and it is obviously secured by using a simple type of fuselage with a substantial amount of external stay bracing. That of course increases the amount of rigging required in re-assembly, but Mr. Perfield suggested no internal bracing. Structurally, he said, it is of the utmost importance that wood members near the pilot be wrapped to prevent splitting and that the safety belt be of sufficient strength and firmly anchored, a penetration sometimes overlooked.

There are no manual fasteners in glider wing construction, except the use of wires that the ordinary amount of plywood covering to secure rigidity and to protect the wing tips against bad landings. A covering over the under surface of the tip was particularly recommended, with the possible addition of wing slots. This is commonly attached by plating rubber strips then sewing, and the author indicated that a completed wing should, notwithstanding the relative crudity of construction in the interest of cheapness, weigh not over 0.6 lb. per sq. in. German practice has been to use winging entirely for the wings, and for the fuselage as far back as possible in primary machines in the United States, but struts have a great advantage in simplicity of rigging and Mr. Perfield did not consider them apparently to increase the cost of original manufacture. The struts have the additional advantage that they are vertical and do not require the slanted bracing that should therefore require no adjustment, whereas wires often stretch in landing and require re-rigging.

The open fuselage of a primary glider, with the lateral area provided for the pilot's body very far forward, makes unusually large vertical tail surfaces desirable. Mr. Perfield recommended a tail rider and an area of about nine per cent of the wing area. Horizontal tail surfaces and struts can be of approximately the same proportions to those of a powered airplane.

THE PROVISION for launching by shock-cord occasions no difficulty to the designer. The design of a releasing mechanism for towing is a somewhat more elaborate problem, upon which Mr. Perfield went into detail. Of special importance, as he pointed out, is the design of a mechanism which will keep the rope from being pulled to a two rope any construction break and it is then necessary to release it to avoid losing the glider on the ground. A hanging rope will of course test both of the vertical, and the simpler form of releasing mechanism may not let it go from that angle.

In conclusion, the subject of stress analysis was treated, but treated with considerable brevity because of lack of full information upon which to base a logical analysis at the present time. The Department of Commerce has imposed certain load factors, but they are to a considerable degree experimental. In any case, in the author's belief as his audience's attention, landing stresses are likely to be more serious than those arising in flight, and a glider designed to last reasonably long life under the conditions that it must encounter on the ground is likely to be well protected against air load, although of course a full stress analysis remains desirable.



HIGH POINTS in the NEWS

► **Map shows carburetor.** Test Pilot J. Whitney Wain engine using an automatic device in place of a carburetor, thus permitting use of either gasoline or kerosene oil.

► **All-American flying.** Agreement 29,632 (28 per cent added) awarded the Third Annual All-American Air Mail Stakes. Report \$141,590 value.

► **After test runs.** New scoring formula among changes made in National Air Tour regulations for 1930.

► **Lower shipping.** Fairchild prices Saturday 5:30 was \$26,000, now \$20,000; Fairchild KR 25 was \$4,600, now \$4,125.

► **More sales, less cost.** Figures released by Col. Clarence M. Young show there were 934 airplanes for the 1929-1930 season.

► **Six test flights.** Colonel Young declares opening tests for high speed testing approved type, including six test flights. However, if conditions warrant a new recovery demonstration will be asked for.

Airport and Airline

► **More direct P.A.A. route.** With the inauguration on April 26 of seven-day New York-Boston-Air Mailfield route, Pan American Airways announced a more direct trip will be made across the Caribbean to the Canal Zone.

► **Two planes for mail.** Starting April 26, both will be received by the office of Second Assistant Postmaster General W. Irving Glover for two months' operation of five and six mail routes.

► **Fatal U.S.A. flight.** Three United States returning under through a Wilmington, Del.) office to permit National Air Transport from Baltimore stock with Eastern Air Transport; which would give NAT control of that company.

Events

► **Only five could survive.** Federation of American Internationalism now has only five members in "World Republic" while individuals in the various plane and engine clubs continue to be called "International Republics."

GENERAL NEWS

Special P. W. News Editor

Airline Orders 100 0-12-8's

WASHINGTON (P. C.) — Curtiss Aeroplane & Motor Co., Garden City, L. I., N. Y., has secured an Army order amounting to \$600,000 for 100 Curtiss 0-12-8 engines and certain spare parts. These will be installed in 4-10 stock planes previously ordered from the Curtiss firm.

Handle 12 Violations In First Quarter of 1930

WASHINGTON (P. C.) — During the last three months of 1930, the Aeronautics Branch handled 132 violations of the Air Commerce Regulations of which number 22 cases are still pending, states Col. Clarence M. Young.

Seven in the number of 230 are assessed and referred for this month's period, Colonel Young said, and penalties in the form of \$1 reprimand, 30 suspensions, two revocations, and two deaths of licenses, were meted out for the violations. In twenty cases, no action was produced which justified dismissal.

Violations of the Air Commerce Regulations dealing with accidents were twenty, but only one specific offense, the number being 20. Violations of the law flying prohibitions against approved type, including pilot flying licensed pilots, foreign; flying without navigation lights, five; and flying without identification marks, numbered 22.

P. & W. Develops New Feed System

**Carburetor Eliminated;
Engine Burns Oil or Gas**

HARTFORD (Conn.) — A device which eliminates the usual carburetor and intake system of the engine in an engine and permits the use of fuel ranging from ordinary kerosene oil to high-octane aviation fuels, has been developed by the Pratt & Whitney Aircraft Co. and was demonstrated last week at Hartford Field before aviation officials and newspaper men.

While the device has been developed from the point of view of the aviation engine, it is equally adaptable to automobile or other gasoline engines, according to P. & W. officials. It has been used successfully for 4,000 mi. in an old model T Ford.

The new system was demonstrated on a standard Ford J. Whitney Wain from which the carburetor had been removed. The engine presented a boring, smooth plane, which was put through most existing ordinary maneuvers by Lt. A. Lewis MacLellan, new pilot of the company. The device automatically accommodates for carburetor and maintains the fuel pressure, delivering it mechanically to each cylinder through independent lines.

From One Tank to Other

So simple is the device that the biggest and the lowest test fuel was used. In the test, aviation gasoline was carried in one tank and kerosene oil in another. While engaged in maneuvers, Lieutenant MacLellan changed at will from one to the other tank.

Pratt & Whitney engineers say that the system, when using gasoline, develops greater power than the ordinary engine installation and provides efficient operation regardless of the temperature of the engine or its position in the air. During the tests, the pilot did the engine work smoothly and thoroughly cooled the engine. As he noted, the ground with the air screw barely raised, the engine cooled the engine and climbed easily to about 2,000 ft. There was no spatter, as is usually heard with a cold feed pump, and the test was made with fuel between oil and gasoline. With this device, cold starting is greatly facilitated, and the device is extremely convenient with water operation is believed to be eliminated.

The fuel is sprayed into each cylinder, where it is mixed with air from the intake valve. High pressure pumps (Continued on Page 11)

Parley to Consider Plane Carrier Limits

LONDON (New York) — An American group is giving a preliminary session of the London Naval Arms Conference is about to take place at which the air limitations of aircraft carriers will be discussed. The group is made up of 100,000 tons or the general armament of all new ships. The United States has not started construction of any plane carriers since the Washington Conference of 1922. However, carrying a carrier plane is not yet been America's answer to the "Lexington" and the "Saratoga" would amount to 90,000 in that class of ships.

Foreign Briefs

A new Heligoland, with four reactors, is being built at which there is 32 ft. Church airport, installed near the top is undergoing preliminary tests at Orly Airport, France.

Kansas has business records have been received for the Air Safety Congress to be held in Paris next December.

The railroad between the Chinese Government and Chinese Airways (controlled by Curtiss-Wright interests) is being revised.

The Wisconsin Works, Inc., has acquired license to manufacture Foster planes in that country. Kerosene Company is licensed to manufacture Dornier planes.

Preliminary to the establishment of air passenger and mail service to the southern tip of South America, Compañía General Aéropostal has opened a line from Buenos Aires to Rio de Janeiro, near the Straits of Magellan. It will be operated weekly with stops at Valparaiso and Comodoro Rivadavia.

A ruling which has just been issued by the Department of Aviation of the Mexican Ministry of Communications forbids aeroplanes over any international airport in Mexico. Planes are also required to take off from the right side of the field and land on the left.

Assignments have been made to provide pilots on the Mexico City-Tijuana line with detailed weather reports by 6:00 a.m. daily.

Chief Developer, associated with Eduardo Barthele, José Barret and Antonio Barret, has applied to the Mexican Government for permission to establish a civilian flying school at Villahermosa, Yucatan.

A new airport has been established at Francisco, state of Coahuila, Mexico, and is used by a line to the Mexico City-El Paso line. It is owned by the city and Francisco Motor Co.

Mexican Ministry of War and Marine is considering plans for establishment of a school of Mexican aviators exclusively for military use.

Airports are now ready for use at Camp Teacote, Ariztiga, Tepic, Sinaloa, Coahuila, San Cristobal de las Casas, Villahermosa, Toluca, Oaxaca, Ocotlán, Pachuca, Tijuana, San Bartolomé, in the state of Chiapas, Mexico. The state is also preparing

emergency fields at Hacienda de Santa Otrera, Coahuila, Salto de Agua, Mérida, and Palencia.

All airport passengers entering Mexico border must show certificates of vaccination and health certificates.

A Mexican chapter of the U. S. National Aeronautic Association is being organized in Mexico City.

American capitalists are backing a company which plans to erect an airfield and airport facility in Pachuca City, near Mexico City.

Biplane planes were flown over 230,000 in an organized air race in 1938 without once a forced landing.

Indian air stations presented by General Baldo Maza 14 air for a total expenditure of about \$20,625,000. No plans for air airports are under consideration.

One Napier engine still in commercial transport use has been flown over 355,000 mi. and the average distance covered by fourteen Napier engines on Imperial Airways planes is 265,000 mi., all these being still in service.

Miss Margery Pashley, 23-year old German girl, is reported to have established a new altitude record for Class C planes by ascending a height of about 15,000 ft. in a Klein equipped with 40 hp. Siemens engine. The former record of 12,000 ft. was made last year by a French aviator.

British Air Force engineers are said to be perfecting a bomb-carrying plane to be operated without crew, intended to crash with its load of explosives on reaching its destination.

The Duchess of Bedford has reached Tunis in the case of her London-Cape Town flight. She accompanied by Capt. C. de Bernard and Robert Little.

Deutsche Luft Hansa has proposed extension of air-rail agreements to cover all European countries, at the meeting of the International Railway Union at Berlin and Nuremberg.

Reductions of from 30 to 40 per cent in air mail rates to Europe, the United States, and to other South American countries, have been made by the government of Peru.

Corder Rodríguez has extended an Brazilian line from Rio de Janeiro to Santa, leaving at 10 p.m. morning, making along the coast to 2,301.

The French Air Ministry has proposed to the Chamber of Deputies a bill

which would subsidize private flying to the extent of part of the original cost of plane, and 50 per cent of postage and maintenance charges.

Captain Renault and Captain Iglesias, the two Spanish fliers who crashed the South Atlantic last year, have been made Knights of the French Legion of Honor.

The 1938 budget of the French Air Ministry, is recently introduced in the Senate, totals about \$79,480,000.

General Mitrachev recently gave on the following figures for facilities in the French Air Service for the last three years: 1935, 4,041; 1936, 4,832; 1937, 5,432; 1938, 4,832; 1939, 4,441.

Chief affiliated with the British Gliding Association, have usually been formed at Cardiff, Epsom, Gloucester, Hinton, Harrogate, Kent, London, Manchester, and Newcastle.

Lord Waldegrave has given \$4,000 to start a fund to promote gliding in England, as well as a cup to be awarded for competition, on a basis to be announced later.

The British Air Ministry is investigating the possibility of establishing a landing area, which would be about 1,800 ft. square, on the top of Waterloo Station, in the center of London. The estimated cost is \$22,000,000.

It is reported that Handley Page, Ltd., is building eight 40-passenger planes for Imperial Airways' London-Paris service.

Seltrig's Department Store, London, now sells Devereux, Mark, Starbird, and Klein planes.

Meritt Aircrafts is building a special airplane for an attempt to break the world's distance record. It will use a 600 hp. Hispano-Suiza engine, and will carry about 1,500 gal. of gasoline.

Negotiations for eight jet and seven piston engine biplanes are being discussed at a conference in Oslo, and contracts may be made which possibly result in the inauguration of the service by May 15. The Berlin-Moscow route is the only night and now flown to Europe.

A delegation of Finnish officers and engineers has gone to France to inspect various engine facilities, and presumably to regulate rights for the French government to manufacture some made of French engine under license.

British Royal Aero Club has abandoned plans for reviving the Aerial Derby this year, owing to lack of interest.

New Aero Club recently formed in France and Belgium are Club de l'Alsace, Patry Aero Club, Lepré des Alpes, Goudail, Club d'Aviation, Legende des Alpes, Lillo, Club d'Aviation, Legende des Alpes, Club Français de Tourisme Aéro.

At a recent British Air Ministry conference for Class C transport certificates, the highest mark was made by Miss F. M. Wood, lecturer at Manchester in London University.

Are You Paying for Timken Bearings Without Getting Them?

The basic requirements of an efficient anti-friction bearing are (1) anti-friction efficiency, (2) maximum radial capacity in the smallest unit of space, (3) thrust capacity without sacrificing the principle of design, (4) combined radial and thrust capacity, (5) take-up to facilitate assembly and compensate for wear.

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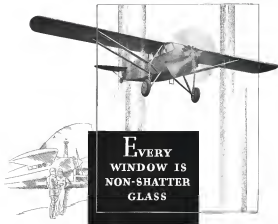
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TIMKEN Tapered Roller BEARINGS

BARANGQUILLA (GUATEMALA)—Statistics covering the operations of Senda in the 11th of its mobile customer have been released by the company headquarters here. The figures are as follows:

	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928
Total tonnage	1,383	1,015	982	901	815	715	615	515	415	315	215
Passenger miles	1,000	750	700	650	600	550	500	450	400	350	300
Freight miles	1,000	750	700	650	600	550	500	450	400	350	300
Passenger miles	1,000	750	700	650	600	550	500	450	400	350	300
Freight miles	1,000	750	700	650	600	550	500	450	400	350	300
Passenger miles	1,000	750	700	650	600	550	500	450	400	350	300
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Freight miles	1,000	750	700	650	600	550	500	450	400	350	300
Passenger miles	1,000	750	700	650	600	550	500	450	400	350	300
Freight miles	1,000	750	700	650	600	550	500	450	400	350	300
Passenger miles	1,000	750	700	650	600	550	500	450	400	350	300
Freight miles	1,000	750	700	650	600	550	500	450	400	350	300



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Stall Speed	105 M. P. H.	115 M. P. H.
Landing Speed	20 M. P. H.	30 M. P. H.
Cruising Speed	115 M. P. H.	125 M. P. H.
Climb	700 ft. per min.	1300 ft. per min.
Rate of Climb	4 1/2 gal. per hr.	7 gal. per hr.
Cruising Range	300 miles	300 miles

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COMET

"low m. e. p."



"Tests in Pressure Multiplied by Area"

The above sketches show how the Comet low m. e. p. design displacement relative to the same power, with less stress than another cylinder of the same displacement and higher m. e. p. But Comet weighs less per horsepower than any piston-engine design except the design which is not built in any way.

When an engineer designs an automobile engine he gives the working parts plenty of reserve strength so they can do their work at some without stress. He also designs for low m. e. p. (brake mean effective pressure)—as low as 100 pounds pressure per square inch—as the engine cannot be made to work as hard as it could work. That is one reason why automobile engines last a long time with few repairs.

But aircraft engine designers have followed the wartime practice of making their engines work at or near their rated capacity. Conventional and aircraft engines, without supercharging, run as high as 120 to 135 pounds per square inch, on the theory that the utmost power must be obtained from the least weight of metal. So durability—reserve strength—is sacrificed for maximum attainable power. The result is expensive maintenance and parts replacement, with the possibility of failure and resulting delays.

Comet sacrifices neither durability nor performance. Durability is attained by building into the vital parts of the engine—the working parts—the weight saved in the simplified valve mechanism and cylinder head. Performance is accomplished by providing an unusually large cylinder displacement which permits building the brake mean effective pressure to a modest figure—112 pounds per square inch.

Durability—another reason why Comet owners are

- FOR SAFETY
- FOR DURABILITY
- FOR ECONOMY

Roll your Comet-powered plane out of the hanger—load up, and fly away. Do it every flying day for a year—or more. Have the valve clearances adjusted every 50 hours—or do it yourself—if it's easy. Take care of oil and greasing. You will not need an overhaul for 300 to 500 hours. Durability (economy) is another advantage of Comet power.

Why?



Comet Engines will be displayed at Madison County Garden and in the Park Central Motor lobby during the War Park Aircraft Show, May 2-10.

at ease in the air

COMET ENGINE CORPORATION

MADISON, WISCONSIN, U. S. A.

Comet aircraft engines are shown in Room 302—222 So. Salomon Street

Comet aircraft engines are manufactured at Madison, Wisconsin, under the direction of the Glushko Machine Company, for 40 years builders of this machine tools is in use throughout the world.

GUARDIANS

OF OUR SKIES



THE HAWK

SWIFT and relentless bird of prey—striking aloft on the wings of the wind to convey a fleet of bombers over the lines, or to repel, with savage fury, an unwelcome visitor at twenty thousand feet.

THE FALCON

SO versatile that it is equally effective as a ground attack plane, swooping low over the tree tops and leaving swift destruction in its wake, or as an observation plane, cruising miles high to ferret out enemy secrets with an all-seeing camera, or to coordinate artillery fire by radio.

BOTH

STANDARD equipment of the U. S. Army Air Corps, both developed under the Curtiss Group Engineering System, in close cooperation with Army Air Corps Engineers, both 100% Curtiss designed, constructed, powered.

CURTISS AEROPLANE & MOTOR CO., Inc.

Offices: Garden City, N. Y. • Factories: Garden City, Buffalo, N. Y.

A DIVISION OF CURTISS-WRIGHT CORPORATION

speaking of *Records*...

THE "WASP" GATHERS IN SIX MORE

LEE SHOENHAIR has just established six new world's speed records for class C airplanes. He flew the "Wasp" powered Lockheed Vega monoplane "Miss Silvertown," owned by the B. F. Goodrich Rubber Company. These new marks are as follows:



WITH 1000 KILOGRAMS LOAD

1. Distance of 100 kilometers at
175.997 miles per hour
2. Distance of 500 kilometers at
168.114 miles per hour
3. Distance of 1000 kilometers at
152.702 miles per hour

WITH 500 KILOGRAMS LOAD

4. Distance of 100 kilometers at
185.42 miles per hour
5. Distance of 500 kilometers at
171.288 miles per hour
6. Distance of 1000 kilometers at
152.702 miles per hour

Recognition by the Federation Aeronautique Internationale of these new records will credit the United States with 23 motor flight, heavier than air world's records. Pratt & Whitney will hold 12 of these, or more than half of this country's heavier than air records, and three times as many as are held by any other American aeronautical engine manufacturer.

Not only in the establishment of world's records, but in the everyday carrying of mail, passengers and express, "Wasp" and "Hornet" engines are demonstrating *dependability* which comes only with proven design and unusual craftsmanship.

THE
PRATT & WHITNEY AIRCRAFT CO.
HARTFORD . . . CONNECTICUT
Division of United Aircraft & Transport Corporation



Manufactured in Canada by Canadian Pratt & Whitney Aircraft Co., Ltd., Longueuil, P. Q.; in Continental Europe by Bavarian Motor Works, Munich; in Japan by Nakajima Aircraft Works, Tokio.

Wasp & Hornet *Engines*

